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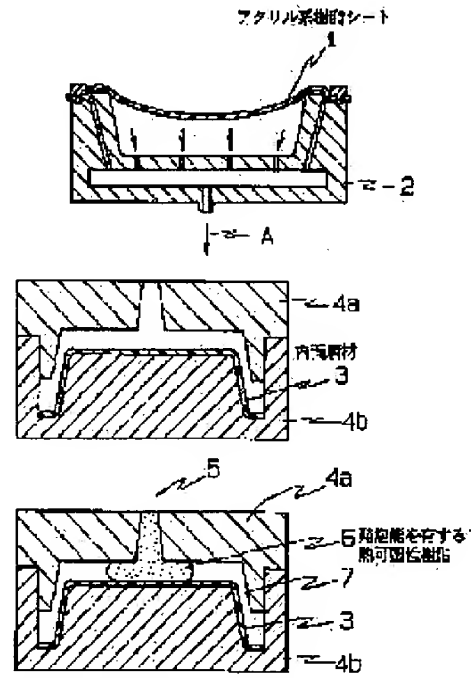
(54) SYNTHETIC RESIN VESSEL OR THE LIKE AND MANUFACTURE THEREOF

(57)Abstract:
PURPOSE: To obtain a synthetic resin vessel or the like having excellent safely sanitary surface for an operator without contaminating the operating environment and having excellent production efficiency by providing the outer shell reinforcing layer of a thermoplastic resin foam on the outer surface of an inner surface layer material molded from an acrylic resin sheet.
CONSTITUTION: An acrylic resin sheet 1 is thermally softened to be evacuated in vacuum in a direction of an arrow A, thereby obtaining an inner surface layer material having the inner surface shape of a synthetic resin vessel or the like. The inner surface layer material 3 is so inserted as to be brought into contact with the moving side mold surface 4b of an injection mold, and a moving side mold surface 4b is moved to a mold closing direction, thereby closing a fixed side mold surface 4a and the surface 4b. After both the molds are closed, thermoplastic resin 6 having foaming capacity previously thermally melted is injected from a gate 5 to a mold cavity 7 surrounded by the material 3 and the surface 4b.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the containers made of synthetic resin, and the process of those. It is related with containers made of synthetic resin, such as a bathtub, a sink, and a washing-its-face ball, and the process of those in more detail.
[0002]
[Description of the Prior Art] Conventionally, what has the two-layer structure is known as a bathtub made of acrylic resin. The bathtub made of acrylic resin which has this two-layer structure is manufactured by making it smooth, carrying out degassing of the FRP layer which sprayed fiberglass reinforced plastics (henceforth FRP) on the thing which the desired bathtub configuration was made to fabricate with the spray gun as reinforcing materials of a lining, and was sprayed on it by next using a hand roll by the vacuum forming generally, after carrying out heating softening of the acrylic resin sheet, and making it harden by the after air drying or stoving.
[0003] However, on the occasion of manufacture of the aforementioned bathtub, since the blasting work, smooth work, etc. of FRP were done by the operator, productive efficiency was bad, and the glass fiber adhered to the skin, or the glass fiber on which the operator dispersed was absorbed a glass fiber not only adheres to an operator's clothes, but, and there was a problem of causing an obstacle.
[0004] Moreover, since FRP is used for the aforementioned bathtub as reinforcing materials, it cannot recycle, in case it is eye a difficult hatchet and disposal to decompose for every raw material in case it discards, and an environmental problem arises at the time of disposal processing.
[0005] Furthermore, since the difference of the coefficient of thermal expansion of the acrylic resin sheet and FRP layer which are used for the aforementioned bathtub was large, and distortion was produced on an acrylic resin sheet and it deteriorated on it by the temperature change while using it, there was a problem that the life of this bathtub was short.
[0006] Moreover, to the aforementioned bathtub, improvement in much more heat retaining property is expected.
[0007]
[Problem(s) to be Solved by the Invention] this invention is excellent in a safe sanitation side for an operator, excellent in (b) productive efficiency, excellent in (c) recycling nature, its (d) life is long, and it is made in view of the aforementioned conventional technology, does not pollute a (b) work environment, and aims [moreover, it excelled also in (e) heat retaining property, for example,] at offering containers made of synthetic resin, such as a bathtub.
[0008]
[Means for Solving the Problem] this invention on the superficies of the tapetum material which fabricated ** acrylic resin sheet and was obtained The containers made of synthetic resin in which it comes to prepare the coat reinforcement layer which consists of a thermoplastics foam And carry out thermoforming of the ** acrylic resin sheet to the configuration of the containers made of synthetic resin, and tapetum material is produced. this tapetum material -- injection molding -- public funds -- insert in type, the thermoplastics which has foaming ability is made to inject and foam on the superficies of this tapetum material, and it is related with the process of the containers made of synthetic resin characterized by making the coat reinforcement layer which consists of a thermoplastics foam form
[0009]
[Function] Since the difference of a coefficient of thermal expansion with the thermoplastics foam which was excellent in heat retaining property as contrasted with FRP used conventionally, and was used as a coat reinforcement layer as the lamination sheet of an acrylic resin sheet and a thermoplastics layer or an acrylic resin sheet, and coat assistant **** since the thermoplastics foam was used is small and the containers' of this invention made of synthetic resin producing distortion on an acrylic resin sheet and deteriorating on it by the temperature change decreases, a life becomes long.
[0010] moreover, the manufacturing process [according to the process of the containers made of synthetic resin of this invention] by an operator's handicraft -- almost -- there is nothing -- mainly -- metal mold -- since a fabrication operation is performed inside, there is an advantage of excelling in a work-environment side and a safe sanitation side, and moreover excelling also in productive efficiency
[0011] Furthermore, since each of each raw materials which constitutes the containers made of synthetic resin of this invention is thermoplastics, they is excellent in recycling nature.

[0012]
[Example] The acrylic resin sheet used for this invention is the lamination sheet of an acrylic resin sheet and a thermoplastics layer, or a colored acrylic resin sheet.
[0013] When it is easy to drop and it is further hard to attach a blemish, when the aforementioned acrylic resin sheet has the glossy smooth and soft touch, and dirt cannot attach it easily and it is stained with dirt, and a blemish sticks, it is hard to be conspicuous, and if a shallow blemish is shaved off and it grinds, it has an exterior and an advantage of the ability to make it restore.
[0014] The aforementioned acrylic resin sheet is a cast sheet made of acrylic resin, such as a polymethylmethacrylate, etc., and since the acrylic resin sheet of partial bridge formation presents surface hardness and the property which was excellent chemical-resistant and was excellent at the time of fabrication especially, it can be used suitable for this invention.
[0015] Although the thickness of the aforementioned acrylic resin sheet does not have limitation especially in this invention, it is desirable that it is usually about 1.5-5mm.
[0016] When using only the aforementioned acrylic resin sheet as an acrylic resin sheet, it can be made to color it a desired color by making the coloring agent of a request of monochrome or multiple color mix in this acrylic resin sheet.
[0017] Moreover, as an acrylic resin sheet, when using the lamination sheet of an acrylic resin sheet and a thermoplastics layer, what was described above as an acrylic resin sheet can be used, and the following can be used as a thermoplastics layer.

[0018] The aforementioned thermoplastics layer reinforces the aforementioned acrylic resin sheet, and has a role holding the configuration of tapetum material after fabrication.
[0019] If the aforementioned acrylic resin sheet can be made to paste through weld or adhesives as a material of the aforementioned thermoplastics layer, there will be especially no limitation. As an example of representation of this material, although ABS plastics, a polycarbonate, a polyolefine system resin, a polyester system resin, etc. are raised, for example, since ABS plastics are excellent in weld nature with an acrylic resin sheet, and shock resistance, in these, the high thermal resistance and the ABS plastics of high rigidity which can use it suitably and have the heat-resistant temperature of 115 degrees C or more especially are especially desirable.
[0020] In addition, in order to raise rigidity, the glass fiber whose length is about 1-6mm, and a mean particle diameter can blend with the aforementioned thermoplastics layer the glass flakes which are usually about 150 micrometers by within the limits whose content is about 10 - 30 % of the weight.
[0021] Although the aforementioned thermoplastics layer thickness does not have limitation especially in this invention, it is desirable that it is usually about 2-6mm.
[0022] In this invention, when this and the thermoplastics layer in which the coloring agent of a request of monochrome or multiple color was made to mix are made to laminate using a thing transparent as the aforementioned acrylic resin sheet, it can deal in the lamination sheet which has a deep color tone.
[0023] Moreover, proper patterns, such as marble, a grain pattern, grain, a geometrical pattern, and a peduncle, are given to this in printing or handwriting as the aforementioned acrylic resin sheet using a transparent acrylic resin sheet, in order to float the pattern to the side describing the after pattern, when the colored thermoplastics layer used as a ground color is made to laminate, the color tone of a thermoplastics layer serves as a ground color, and a pattern can be seen through.
[0024] A lamination with the aforementioned acrylic resin sheet and the aforementioned thermoplastics layer can be performed by a method, the extrusion laminating method, etc. which are made to unify using adhesives.
[0025] When making an acrylic resin sheet and a thermoplastics layer unify using adhesives, an ethylene vinylacetate copolymer etc. can be used as adhesives.
[0026] When it laminates an acrylic resin sheet and a thermoplastics layer by the aforementioned extrusion laminating method, both can be made to unify by heating an acrylic resin sheet beforehand, considering as a softening state, making it stuck to a calendering roll by pressure on both sides of the thermoplastics of the melting state extruded by this in the shape of a sheet with the extruder, and laminating.
[0027] By giving thermoforming to the configuration of the containers made of synthetic resin, tapetum material is obtained in the aforementioned acrylic resin sheet. In addition, when fabricating a bathtub etc., using the lamination sheet of an acrylic resin sheet and a thermoplastics layer as the aforementioned acrylic resin sheet, tapetum material is obtained by giving thermoforming to the configuration of a bathtub, as an acrylic resin sheet becomes an inside side.
[0028] As the method of the aforementioned thermoforming, although there is especially no limitation, since it can deal in the mold goods which a vacuum-forming method, a pressure-forming method, etc. are raised as a typical method, for example, and have an inside smooth especially, the vacuum-forming method using the female is [that what is necessary is just to be able to fabricate an acrylic resin sheet in the configuration of the containers made of synthetic resin] desirable.
[0029] the next -- the aforementioned tapetum material -- injection molding -- public funds -- the containers made of synthetic resin are completed by making the coat reinforcement layer which insert in type, and the thermoplastics which has foaming ability is made to inject and foam on the superficies of this tapetum material, and consists of a thermoplastics foam form
[0030] The process after the process which carries out thermoforming of the aforementioned acrylic resin sheet is explained based on a drawing below.
[0031] First, as shown in drawing 1 , the tapetum material which has the inside configuration of the containers made of synthetic resin is obtained by setting to the vacuum forming machine (not shown) which has vacuum-forming type 2 which

has a configuration corresponding to the inside configuration of the containers made of synthetic resin for the acrylic resin sheet 1, carrying out heating softening of this acrylic resin sheet 1, and carrying out vacuum length in the direction of arrow A.

[0032] the tapetum material 3 obtained next as shown in drawing 2 (a) -- injection molding -- a public-funds type movement side -- metal mold -- field 4b is touched -- as -- inserting -- a movement side -- metal mold -- field 4b -- metal mold -- it moves in the close direction -- making -- a fixed side -- metal mold -- a field 4a side and a movement side -- metal mold -- field 4b is closed

[0033] both -- the thermoplastics 6 which has the foaming ability by which heating melting was carried out beforehand as shown in drawing 2 (b) after closing metal mold -- the gate 5 to the tapetum material 3, and a fixed side -- metal mold -- the metal mold surrounded by field 4a -- it injects into a cavity 7

[0034] As thermoplastics used for the thermoplastics 6 which has the aforementioned foaming ability, if it can be made to weld to the tapetum material 3, there will be especially no limitation. As an example of representation of this thermoplastics, ABS plastics, a polycarbonate, a polyolefine system resin, a polyester system resin, etc. are raised, for example. In addition, it is desirable that the tapetum material 3 and compatibility use a good thing in consideration of weld nature on the occasion of use. In the aforementioned thermoplastics, the ABS plastics which are excellent in shock resistance and have high rigidity in an about 80-90-degree C temperature field are especially desirable. Therefore, in this invention, an ABS-plastics foam can be suitably used as a thermoplastics foam.

[0035] Moreover, to the aforementioned thermoplastics, various additives can be added if needed.

[0036] As an example of representation of the aforementioned additive, bulking agents, such as fiber, such as a glass fiber, and talc, a flame retarder, an anti-fungus and mildewproofing agent, a coloring agent, etc. are raised, for example.

[0037] As the aforementioned additive, when a glass fiber is added, since the thermoplastics foam obtained becomes the thing excellent in rigidity, it is desirable. In this case, in order to make sufficient rigidity give, it is desirable to adjust so that the fiber length of a glass fiber may be set to about 1-6mm and a content may set it 10 - 30 % of the weight.

[0038] From the above thing, a glass fiber strengthening ABS-plastics foam is especially used suitably as a thermoplastics foam in this invention.

[0039] The thermoplastics 6 which has the aforementioned foaming ability is obtained by mixing a foaming agent to thermoplastics and carrying out melting kneading.

[0040] The aforementioned foaming agent will not be especially limited, if it is the optimal foaming agent for the thermoplastics used. As an example of representation of this foaming agent, physical foaming agents, such as chemistry foaming agents, such as an AZOJI carvone amide and a sodium bicarbonate, a pentane, and butane, are raised, for example.

[0041] Although the amount of the aforementioned foaming agent used cannot generally be ******(ed) since it changes with kinds of this foaming agent etc., it is desirable to adjust so that it may usually become 0.5 - 10 weight section, and ********** 1 - 5 weight sections grade to the thermoplastics 100 weight section.

[0042] in addition, the thermoplastics 6 which has foaming ability -- metal mold -- before injecting in a cavity 7 -- beforehand -- inert gas, such as for example, nitrogen gas, -- a pressurization state -- metal mold -- since the way which pressed fit in the cavity 7 and was put under counter pressure can prevent foaming in the front face of the Plastic solid immediately after injection, it is desirable Moreover, when it puts under counter pressure in this way, the aforementioned inert gas is made to emit before the completion of injection, or after the completion of injection.

[0043] the account of before -- the thermoplastics 6 which has the foaming ability by which heating melting was carried out beforehand -- the metal mold from the gate 5 -- the pressure at the time of making a cavity 7 inject -- metal mold -- from [that it is desirable to carry out injection molding by the low pressure as much as possible in consideration of that the projected area of a cavity 7 is large and preventing that the acrylic resin sheet of the tapetum material 3 is damaged] -- usually -- 50 - 150 kg/cm2 It is desirable that it is (G).

[0044] the above -- metal mold -- the fill of thermoplastics 6 which has the foaming ability injected in a cavity 7 -- metal mold -- it considers as an amount fewer than the capacity of a cavity 7 -- having -- usually -- metal mold -- it is about 80 - 95% of the capacity of a cavity 7 The expansion ratio of the thermoplastics foam obtained can be adjusted to a predetermined value and usual [about 1.1 to 1.5-time] by adjusting the fill of thermoplastics 6 which has this foaming ability, and the kind and addition of a foaming agent.

[0045] making the thermoplastics 6 which has the aforementioned foaming ability inject -- metal mold -- the thermoplastics 6 which has this foaming ability within a cavity 7 is made to foam

[0046] Consequently, as shown in drawing 2 (c), the coat reinforcement layer 10 whose interior a surface is the non-foaming layer (skin) 8 and is the foaming layer 9 is formed. moreover, this -- simultaneously -- beforehand -- metal mold -- the tapetum material 3 inserted into the cavity 7 is heated with the sensible heat obtained from the thermoplastics 6 which has foaming ability, and pressurization weld is firmly carried out with the aforementioned coat reinforcement layer 10

[0047] in addition, when preparing a heavy-gage portion like a level adjustment foot receptacle, or when you need the coat reinforcement layer 10 which has a high expansion ratio more, it is shown in drawing 2 (d) -- as -- a movement side -- metal mold -- making the whole surface of field 4b, or its portion slide in the direction of arrow B -- metal mold -- what is necessary is just to make the capacity of a cavity 7 expand

[0048] A part of thermoplastics 6 which has the foaming ability of a melting state injected in the cavity 7 reaches solidification temperature. namely, metal mold -- In and the place which the thermoplastics 6 which has the foaming ability of

other portions cooled even in the state where solidification temperature is not yet reached a movement side -- metal mold, making the whole surface of field 4b, or its part slide in the direction of arrow B an injection-molding-machine nozzle (not shown) and/or a fixed side -- metal mold -- the metal mold from the nozzle (not shown) prepared in field 4a -- the inside of a cavity 7 -- a compression gas -- pouring in -- a movement side -- metal mold -- by making field 4b slide by predetermined Mr. Atsushi of mold goods metal mold -- the capacity of a cavity 7 can be made to be able to expand and a centrum can be made to form in the part in the coat reinforcement layer 10 Thus, when a centrum is made to form in the coat reinforcement layer 10, lightweight-izing of the containers made of synthetic resin obtained and improvement in adiathermancy can be aimed at.
[0049] The containers made of synthetic resin to which the inside reinforced this with the thermoplastics foam with the acrylic resin sheet are obtained by cooling metal mold, and next, cooling and carrying out the mold aperture of the mold goods.
[0050]
[Effect of the Invention] Since according to the process of the containers made of synthetic resin of this invention work environments, such as spraying of FRP, are injured like before and complicated work moreover is not required, the effect of excelling in a work-environment sanitation side and excelling in productivity is done so.
[0051] Moreover, the effect that excel in heat retaining property since a thermoplastics foam with small thermal conductivity is used for the containers of this invention made of synthetic resin as contrasted with FRP used conventionally as a coat reinforcement layer, and a life becomes long since the difference of the coefficient of thermal expansion of an acrylic resin sheet and the thermoplastics foam used as a coat reinforcement layer is moreover small and it is rare to produce distortion in an acrylic resin sheet side, and to deteriorate in it by the temperature change is done so.
[0052] Furthermore, since each of each raw materials with which the containers made of synthetic resin of this invention constitute these containers made of synthetic resin is thermoplastics, they is excellent in recycling nature.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The containers made of synthetic resin in which it comes to prepare the coat reinforcement layer which becomes the superficies of the tapetum material which fabricated the acrylic resin sheet and was obtained from a thermoplastics foam
[Claim 2] The containers made of synthetic resin according to claim 1 in which the coat reinforcement layer which becomes the superficies of the tapetum material which an acrylic resin sheet is a lamination sheet of an acrylic resin sheet and a thermoplastics layer, and was fabricated so that this acrylic resin sheet might become an inside side from a thermoplastics foam was prepared
[Claim 3] The containers made of synthetic resin according to claim 1 whose acrylic resin sheet is a colored acrylic resin sheet

[Claim 4] The containers made of synthetic resin according to claim 2 or 3 whose acrylic resin sheet is an acrylic resin sheet of partial bridge formation
[Claim 5] The containers made of synthetic resin according to claim 2 whose thermoplastics layer is an ABS-plastics layer
[Claim 6] The containers made of synthetic resin according to claim 1, 2, 3, 4, or 5 whose thermoplastics foam is an ABS-plastics foam
[Claim 7] The containers made of synthetic resin according to claim 1, 2, 3, 4, or 5 whose thermoplastics foam is a glass fiber strengthening ABS-plastics foam
[Claim 8] an acrylic resin sheet -- the configuration of the containers made of synthetic resin -- thermoforming -- carrying out -- tapetum material -- producing -- this tapetum material -- injection molding -- public funds -- the process of the containers made of synthetic resin characterized by making the coat reinforcement layer which insert in type, and the thermoplastics which has foaming ability is made to inject and foam on the superficies of this tapetum material, and consists of a thermoplastics foam form
[Claim 9] The process of the containers made of synthetic resin according to claim 8 which an acrylic resin sheet is a lamination sheet of an acrylic resin sheet and a thermoplastics layer, carry out thermoforming to the configuration of the containers made of synthetic resin as this acrylic resin sheet becomes an inside side, and produce tapetum material.
[Claim 10] The process of the containers made of synthetic resin according to claim 8 whose acrylic resin sheet is a colored acrylic resin sheet.
[Claim 11] The process of the containers made of synthetic resin according to claim 9 or 10 whose acrylic resin sheet is an acrylic resin sheet of partial bridge formation.
[Claim 12] The process of the containers made of synthetic resin according to claim 9 whose thermoplastics layer is an ABS-plastics layer.
[Claim 13] The process of the containers made of synthetic resin according to claim 8, 9, 10, 11, or 12 whose thermoplastics foam is an ABS-plastics foam.
[Claim 14] The process of the containers made of synthetic resin according to claim 8, 9, 10, 11, or 12 whose thermoplastics foam is a glass fiber strengthening ABS-plastics foam.
[Claim 15] partial -- or -- all-out -- metal mold -- the process of the containers made of synthetic resin according to claim 8, 9, 10, 11, 12, 13, or 14 which the capacity of a cavity is expanded [kinds] and make a centrum form in a part of coat reinforcement layer

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[Translation done.]